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A SYSTEM OF SERIES CONNECTED PHOTOELECTRIC CELLS

by

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Translation of "Anordnung zur Reihenschaltung von lichtelektrischen Zellen"

German Patent No. 655,927, January 1938

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A SYSTEM OF SERIES CONNECTED PHOTOELECTRIC CELLS¹

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Photoelectric cell layers, in which a light sensitive material must be exposed through a conductive cover layer which is transparent to light, and in which this cover layer and a conductive support plate of the material form the electrodes, can only produce a small voltage

(approximately a millivolt) per lux and per cm^2 of area. It is therefore generally necessary to amplify the current for cells which have small areas and weak light intensities; this is suitably done by the known vacuum tube.

The usual amplifier tubes are voltage amplifiers, i.e. they should have no measurable flow of grid current. Consequently, and because of the small cell voltage, they do not supply enough amplification to justify the use of an expensive tube. Only if several 1/100 or 1/10 volt potentials are applied to the tube grid do useful and applicable amplifications take place in the plate circuit of the tube. For such a case it is necessary to connect the cells in series.

The electrical connection of the different cells which must be connected together cannot be made by allowing the layers of the light sensitive material to be in contact with each other, as in the case of cell plates composed of cell groups used for the purpose of picture transmission. This would not produce a voltage rise series connection. The latter is necessary to conductively connect the cover layer of each cell to the support layer of the next cell.

The object of the invention is a system to make the connection between two cells, for series connection systems of cells of the above described type, in a manner which is as simple as possible, i.e. without additional use of screwed terminals, rivet joints or solder. This task is solved by limiting the superposition of cover and support electrodes of neighboring cells to very small parts of the cell areas, in such a way that the small areas which are mutually in contact easily permit the making of an electrical connection, whereas the larger part of the cover layers which remains free insures sufficient exposure of each cell.

¹Patent No. 655927, Class 21g, Group 29, F71449 VIII c/21g, German Reich Patent Office, granted 6 January 1938, published 26 January 1938.
Entered U.S. Patent Office Library, 12 February 1938.

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The invention can be carried out in different ways, as will be explained in the following. One example is the arrangement of the cells on a central pin, as in selenium rectifiers. For the purpose of the invention, which requires area exposure of each individual cell, it is not possible, however, to place the cells surface to surface, as in the case of the rectifier example, because in such a way the support electrodes would completely hide the cover electrodes so that the latter would not be exposed to light. The exposure of the narrow edges of the cell layer which would be the only remaining exposed areas is of no value for the photoelectric cells which require substantial exposed area.

The figures show several construction examples in accordance with the invention.

Figure 1 shows part of a series of cells in which the individual cells are placed in shingle fashion, in contact with each other with their edges, such that the cover layer of one cell is in direct conductive contact along an edge strip of the support plate of the next cell. The light transparent layer is indicated by a, the layer of the light sensitive material is indicated by b, and the support plate of the individual cell is indicated by c. The connection to the uppermost cell is indicated by e. The base of the series of cells is made of insulated material. The cells are held on the base by anchors which are not shown in the drawing.

In Figure 2 the series of cells consists of individual cells of the same diameter, with layers a, b, c stacked on pin h. Between every two cells there is a layer d of soft metal. The edges of the cells are cut in such a way that light coming from the side strikes an annular surface of the cover layer. The cell layers proper can be annular in order to save material.

The series of cells shown in Figure 3 consists of individual cells whose diameter form steps so that the whole arrangement becomes cone-shaped when the cells are stacked on pin h. In this arrangement the surface exposed to light is greater than in Figure 2. Beveling the edges is not necessary in this case; it would, however, help to reduce the diameter of the largest cell.

In order to give the two latter constructions a good exposure, they are placed in the focus of a mirror or lens system which lets the light beam strike the series of cells sideways. Instead of pin h a clip or a frame could also be used for holding the individual cells together. The mentioned layer of soft metal has the purpose of insuring a good contact between cells. For the same purpose it is advantageous to secure the cells under pressure against each other.

CLAIMS

1. Arrangement for series connection of photoelectric cells, each having a layer of light sensitive material to be exposed through a cover electrode, characterized by the fact that the superposition of cover and support electrodes of neighboring cells is limited to small parts of the cell areas, such that on one hand the electrical connection of neighboring cells is easily made, while on the other hand a sufficient exposure of each cell is insured on that part of its cover layer which remains free.

2. Arrangement according to claim No. 1, characterized by the fact that disk-shaped individual cells are superimposed in shingle fashion.

3. Arrangement according to claim No. 1 characterized by the fact that disk-shaped, or annular cells, which are stacked in a known fashion on a pin are beveled in such a way that surface-exposed edge zones are created on the cover layers.

4. Arrangement according to claim No. 3, characterized by the fact that the stacked disk-shaped cells have their diameters step-shaped.

Translated for National Aeronautics and Space Administration
by John F. Holman & Co., Inc.

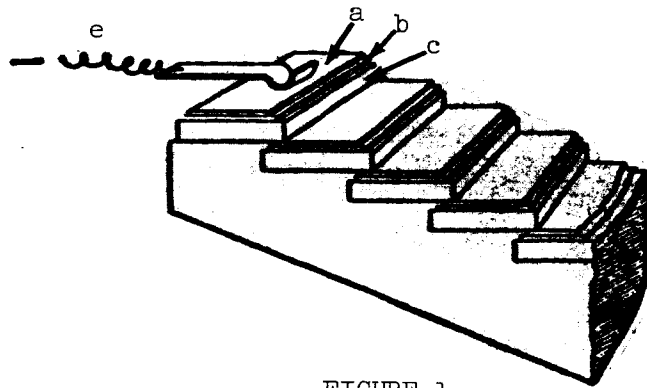


FIGURE 1

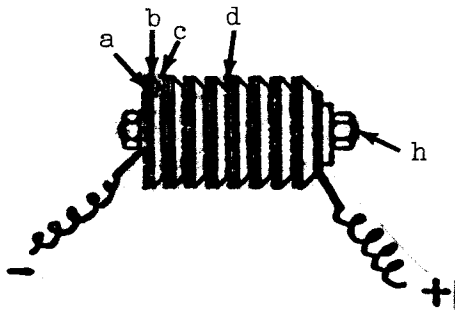


FIGURE 2

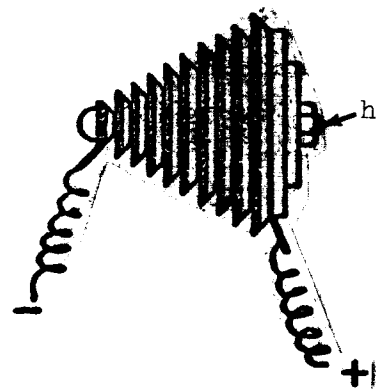


FIGURE 3

Type 22
 Production
 Control Method

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 Production
 Control Method